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(54) **AUTOMATICALLY DETERMINING A CURRENT VALUE FOR A HOME**

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G06Q 30/02 (2012.01)
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CPC ***G06Q 30/0278*** (2013.01); ***G06Q 30/02*** (2013.01); ***G06Q 50/16*** (2013.01)

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USPC 705/306
See application file for complete search history.

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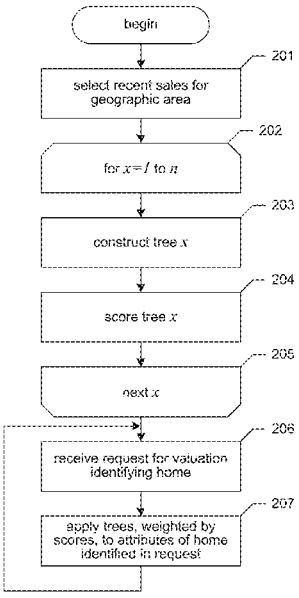
(57) **ABSTRACT**

A facility for valuing a distinguished home located in a distinguished geographic area is described. The facility receives home attributes for the distinguished home. The facility obtains valuation for the distinguished home by applying to the received home attributes evaluation model for homes in the distinguished geographic area that has been trained using selling price and home attribute data from homes recently sold in the distinguished geographic area. The facility reports the obtained valuation for the distinguished home.

43 Claims, 11 Drawing Sheets



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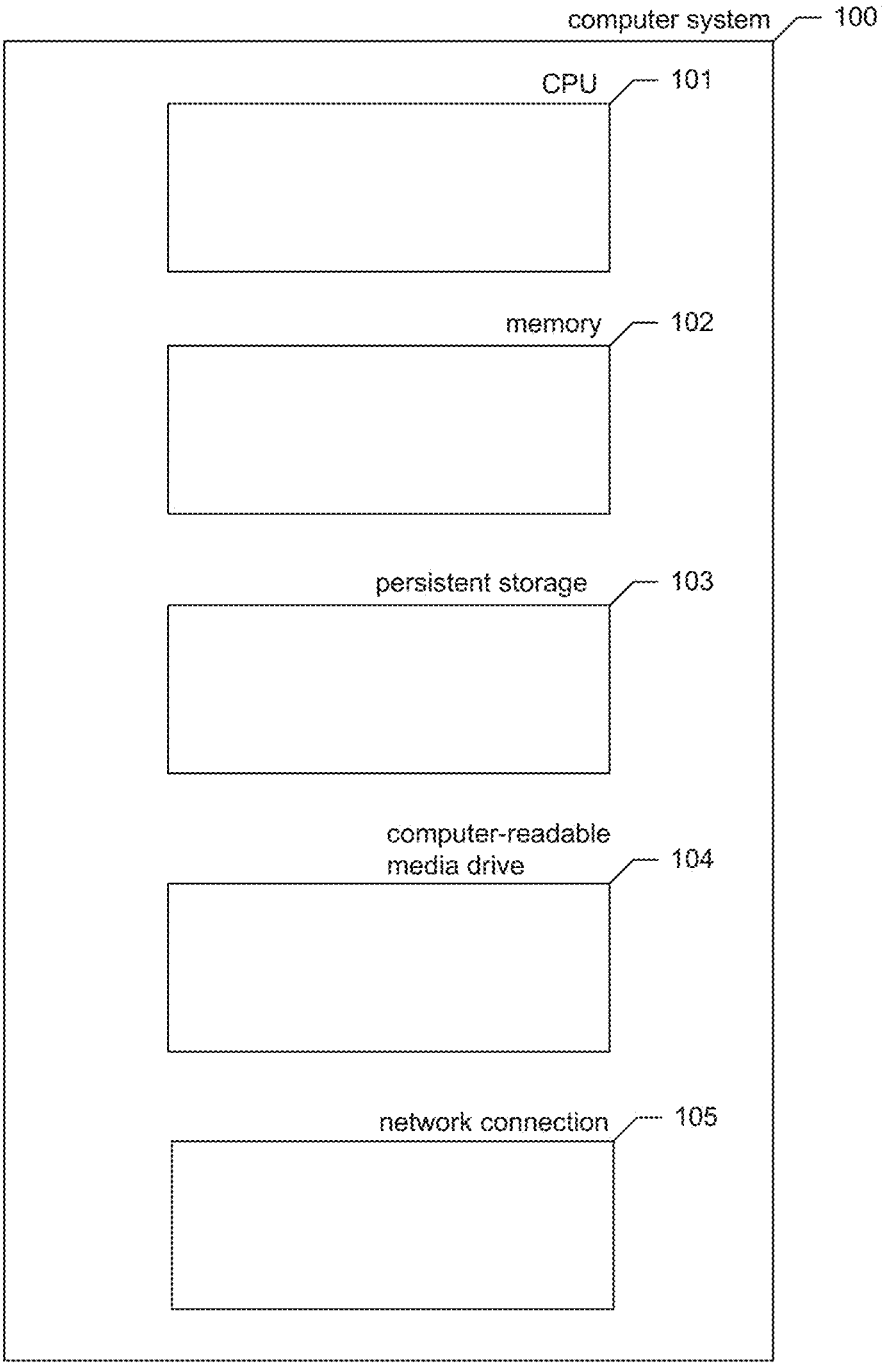
computer system
100
CPU
101
memory
102
persistent storage
103
computer-readable
media drive
104
network connection
105

FIG. 1

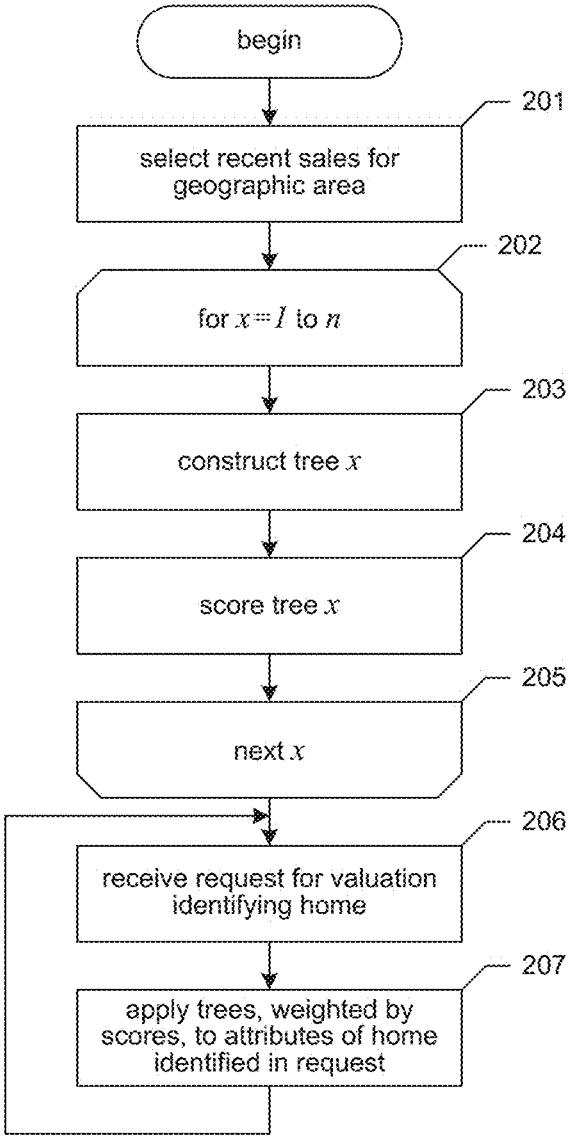
begin
201
select recent sales for geographic area
202
for $x = 1$ to n
203
construct tree x
204
score tree x
205
next x
206
receive request for valuation identifying home
207
apply trees, weighted by scores, to attributes of home identified in request

FIG. 2

Henderson County recent sales table 300

id	address	sq. ft.	bedrooms	bathrooms	floors	view	year	selling price	date	
1	111 Main St., Hendricks, IL 62012	1850	4	2	2	no	1953	$132,500	1/3/2005	301
2	96 Elm St., Hendricks, IL 62014	2220	6	2	3	no	1965	$201,000	1/8/2005	302
3	140 Cottontail Rd., Baron, IL 62019	1375	3	1	1	no	1974	$98,750	1/11/2005	303
4	6 Spratt Ln., Baron, IL 62019	1590	2	2	1	no	1973	$106,500	1/14/2005	304
5	776 Fir St., Hendricks, IL 62014	2280	3	3	2	yes	1948	$251,000	1/26/2005	305
6	111 Industry Ave., Fenton IL 62017	1950	2	2	1	no	1925	$240,000	2/4/2005	306
7	105 Elm St., Hendricks, IL 62014	2180	5	2	3	yes	1940	$230,000	2/4/2005	307
8	110 Muffet St., Baron, IL 62019	1675	4	2	1	no	1975	$74,900	2/14/2005	308
9	156 Elm St., Hendricks, IL 62014	2400	6	3	2	yes	1938	$253,500	2/15/2005	309
10	142 Cottontail Rd., Baron, IL 62019	1450	3	1	1	no	1966	$102,000	2/18/2005	310
11	160 Prospect Bldv., Fenton IL 62017	1952	4	2	1	no	1920	$230,000	2/20/2005	311
12	36 Spratt Ln., Baron, IL 62019	1475	4	2	1	no	1964	$111,000	2/20/2005	312
13	118 Main St., Hendricks, IL 62012	2140	5	2	2	no	1935	$211,000	2/21/2005	313
14	234 Cottontail Rd., Baron, IL 62019	1980	4	3	2	yes	1930	$197,900	2/24/2005	314
15	677 Fir St., Hendricks, IL 62014	2320	5	3	2	yes	1927	$238,000	2/28/2005	315
		321	322	323	324	325	326	327	328	329	330

FIG. 3

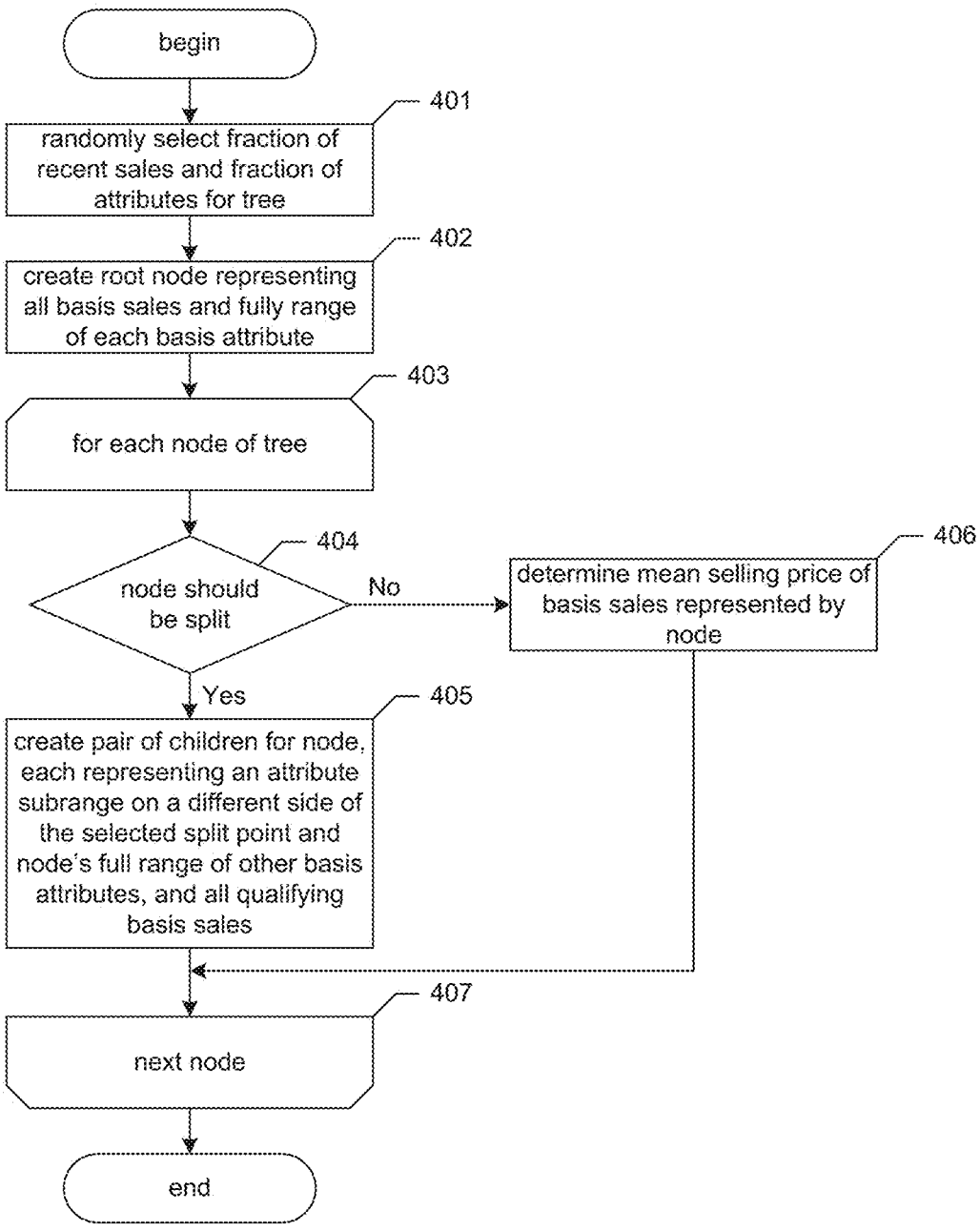
begin
401
randomly select fraction of recent sales and fraction of attributes for tree
402
create root node representing all basis sales and fully range of each basis attribute
403
for each node of tree
404
node should be split
No
406
determine mean selling price of basis sales represented by node
Yes
405
create pair of children for node, each representing an attribute subrange on a different side of the selected split point and node's full range of other basis attributes, and all qualifying basis sales
407
next node
end

FIG. 4A

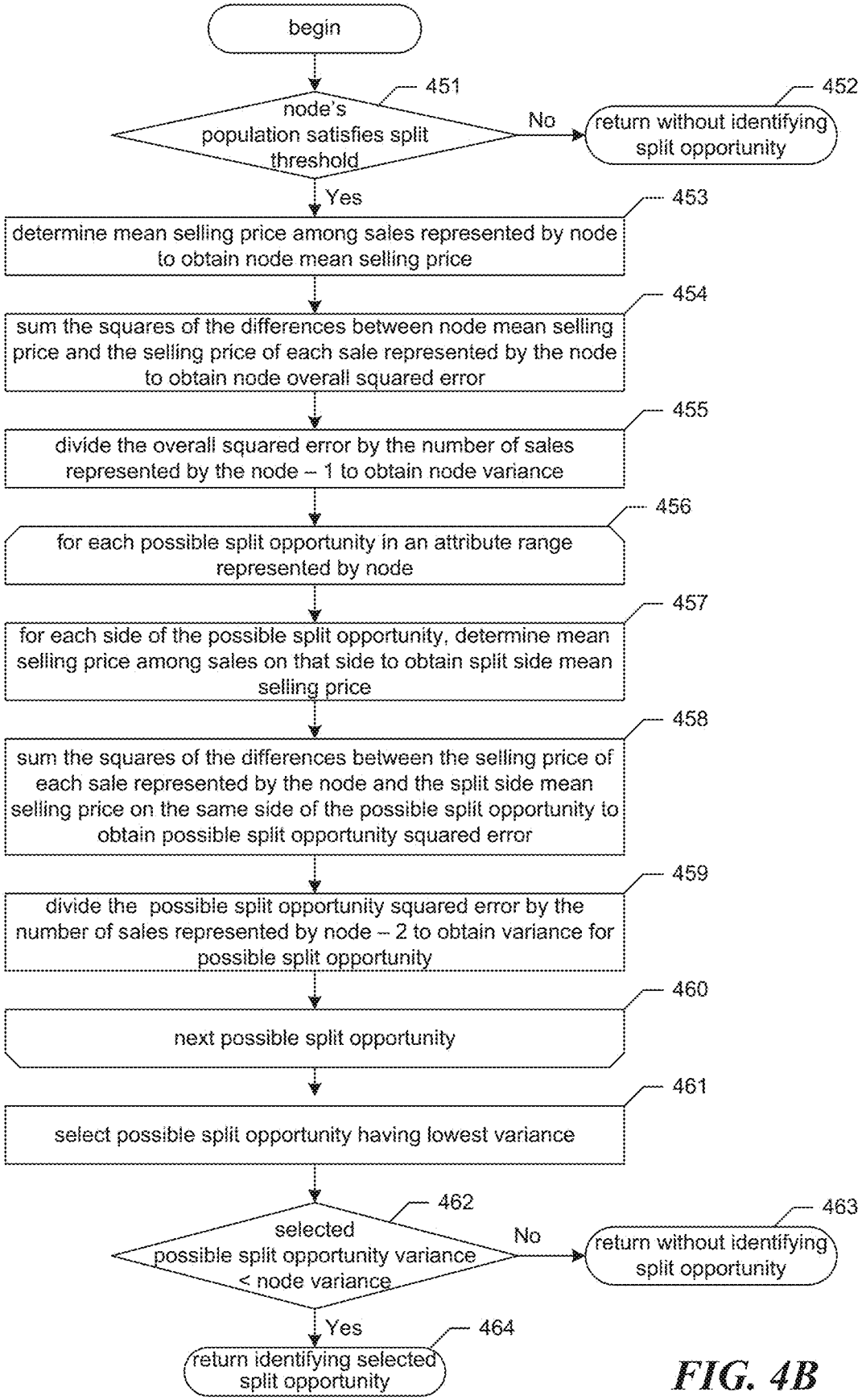
begin
451
node's population satisfies split threshold
No
452
return without identifying split opportunity
Yes
453
determine mean selling price among sales represented by node to obtain node mean selling price
454
sum the squares of the differences between node mean selling price and the selling price of each sale represented by the node to obtain node overall squared error
455
divide the overall squared error by the number of sales represented by the node – 1 to obtain node variance
456
for each possible split opportunity in an attribute range represented by node
457
for each side of the possible split opportunity, determine mean selling price among sales on that side to obtain split side mean selling price
458
sum the squares of the differences between the selling price of each sale represented by the node and the split side mean selling price on the same side of the possible split opportunity to obtain possible split opportunity squared error
459
divide the possible split opportunity squared error by the number of sales represented by node – 2 to obtain variance for possible split opportunity
460
next possible split opportunity
461
select possible split opportunity having lowest variance
462
selected possible split opportunity variance < node variance
No
463
return without identifying split opportunity
Yes
464
return identifying selected split opportunity

FIG. 4B

tree 1 basis table 500

id	address	bedrooms	view	selling price	
2	96 Elm St., Hendricks, IL 62014	6	no	$201,000	302
8	110 Muffet St., Baron, IL 62019	4	no	$74,900	308
9	156 Elm St., Hendricks, IL 62014	6	yes	$253,500	309
11	160 Prospect Bldv., Fenton IL 62017	4	no	$230,000	311
13	118 Main St., Hendricks, IL 62012	5	no	$211,000	313
15	677 Fir St., Hendricks, IL 62014	5	yes	$238,000	315
	321	322	324	327	329

FIG. 5

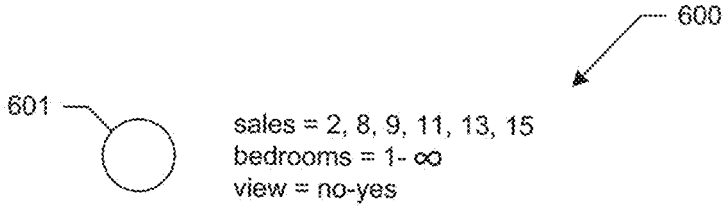
600
601
sales = 2, 8, 9, 11, 13, 15
bedrooms = 1- ∞
view = no-yes

FIG. 6

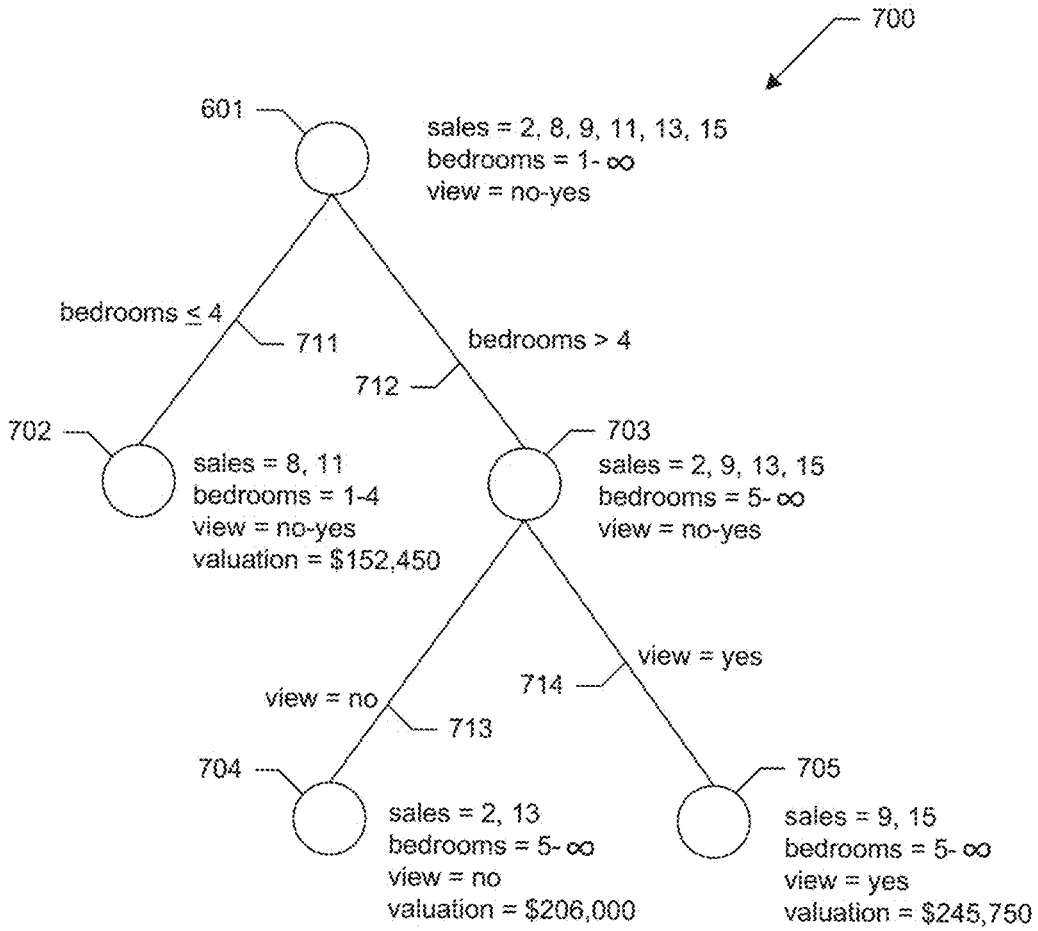
700
601
sales = 2, 8, 9, 11, 13, 15
bedrooms = 1- ∞
view = no-yes
bedrooms ≤ 4
711
bedrooms > 4
712
702
sales = 8, 11
bedrooms = 1-4
view = no-yes
valuation = $152,450
703
sales = 2, 9, 13, 15
bedrooms = 5- ∞
view = no-yes
view = yes
714
view = no
713
704
sales = 2, 13
bedrooms = 5- ∞
view = no
valuation = $206,000
705
sales = 9, 15
bedrooms = 5- ∞
view = yes
valuation = $245,750

FIG. 7

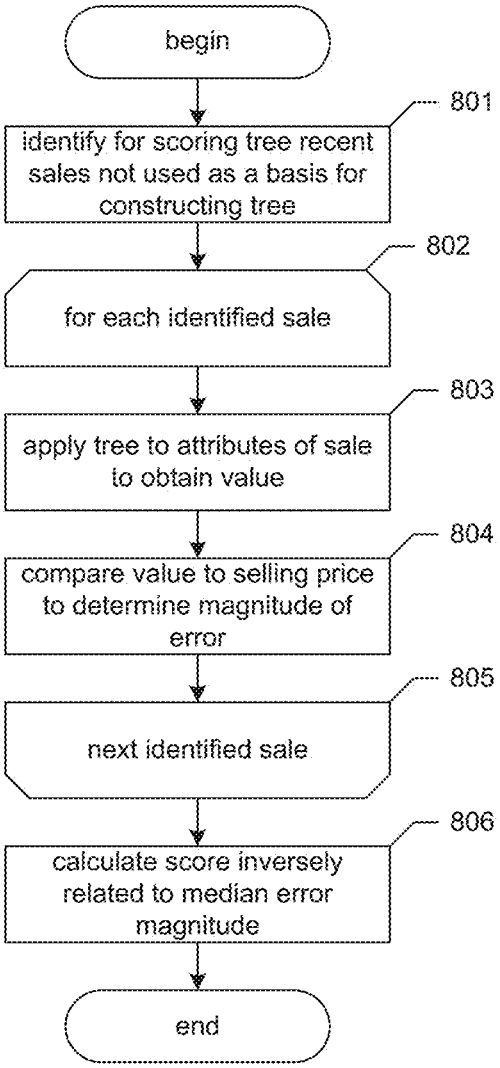
begin
801
identify for scoring tree recent sales not used as a basis for constructing tree
802
for each identified sale
803
apply tree to attributes of sale to obtain value
804
compare value to selling price to determine magnitude of error
805
next identified sale
806
calculate score inversely related to median error magnitude
end

FIG. 8

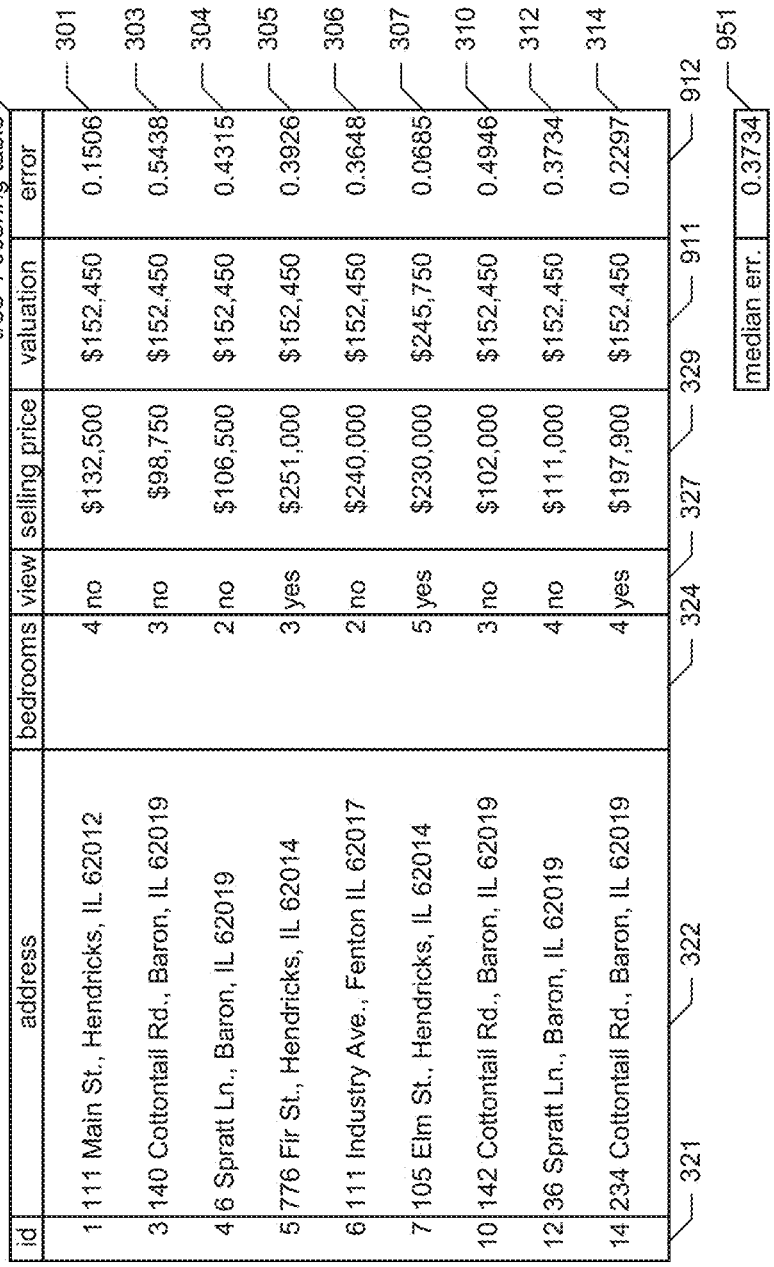
900
tree 1 scoring table
id
address
bedrooms
view
selling price
valuation
error
1
111 Main St., Hendricks, IL 62012
4
no
$132,500
$152,450
0.1506
3
140 Cottontail Rd., Baron, IL 62019
3
no
$98,750
$152,450
0.5438
4
6 Spratt Ln., Baron, IL 62019
2
no
$106,500
$152,450
0.4315
5
776 Fir St., Hendricks, IL 62014
3
yes
$251,000
$152,450
0.3926
6
111 Industry Ave., Fenton IL 62017
2
no
$240,000
$152,450
0.3648
7
105 Elm St., Hendricks, IL 62014
5
yes
$230,000
$245,750
0.0685
10
142 Cottontail Rd., Baron, IL 62019
3
no
$102,000
$152,450
0.4946
12
36 Spratt Ln., Baron, IL 62019
4
no
$111,000
$152,450
0.3734
14
234 Cottontail Rd., Baron, IL 62019
4
yes
$197,900
$152,450
0.2297
median err.
0.3734
301
303
304
305
306
307
310
312
314
321
322
324
327
329
911
912
951

FIG. 9

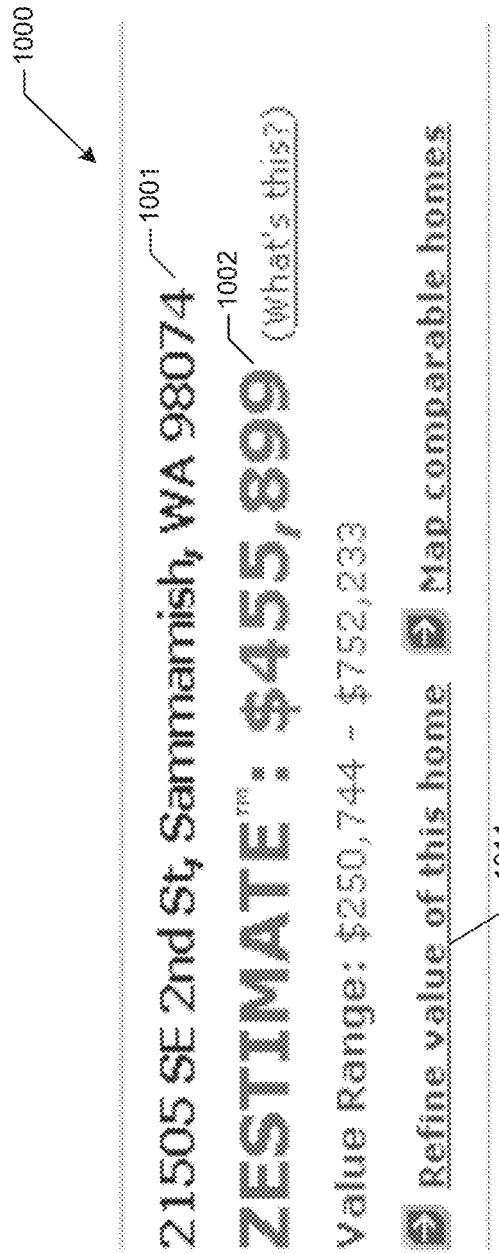
1000
21505 SE 2nd St, Sammamish, WA 98074
1001
ZESTIMATE™: $455,899
1002
(What's this?)
Value Range: $250,744 - $752,233
Refine value of this home
1011
Map comparable homes

FIG. 10

1161
1111
1110
1160
1159
1109
1101
1151
1153
1103
1152
1102
1104
1154
1105
1155
1100
1106
1156
1107
1157
1158
1108
1112
1162
$271K
$305K
$570K
$512K
$475K
$512K
$146K
$176K
$248K
$806K
$921K
$287K
Homes
Street
City
State
USA
N
E
W
S
50ft
200ft

FIG. 11

AUTOMATICALLY DETERMINING A CURRENT VALUE FOR A HOME

CROSS-REFERENCE TO RELATED APPLICATION(S)

This application is a continuation of U.S. patent application Ser. No. 14/167,962, entitled "AUTOMATICALLY DETERMINING A CURRENT VALUE FOR A HOME," filed on Jan. 29, 2014, which is a continuation of U.S. patent application Ser. No. 11/347,000, now U.S. Pat. No. 8,676,680, entitled "AUTOMATICALLY DETERMINING A CURRENT VALUE FOR A HOME," filed on Feb. 3, 2006, both of which are incorporated herein by reference in their entireties.

TECHNICAL FIELD

The described technology is directed to the field of electronic commerce techniques, and, more particularly, to the field of electronic commerce techniques relating to real estate.

BACKGROUND

In many roles, it can be useful to be able to accurately determine the value of residential real estate properties ("homes"). As examples, by using accurate values for homes: taxing bodies can equitably set property tax levels; sellers and their agents can optimally set listing prices; buyers and their agents can determine appropriate offer amounts; insurance firms can properly value their insured assets; and mortgage companies can properly determine the value of the assets securing their loans.

A variety of conventional approaches exist for valuing houses. Perhaps the most reliable is, for a house that was very recently sold, attributing its selling price as its value. Unfortunately, following the sale of a house, its current value can quickly diverge from its sale price. Accordingly, the sale price approach to valuing a house tends to be accurate for only a short period after the sale occurs. For that reason, at any given time, only a small percentage of houses can be accurately valued using the sale price approach.

Another widely-used conventional approach to valuing houses is appraisal, where a professional appraiser determines a value for a house by comparing some of its attributes to the attributes of similar nearby homes that have recently sold ("comps"). The appraiser arrives at an appraised value by subjectively adjusting the sale prices of the comps to reflect differences between the attributes of the comps and the attributes of the house being appraised. The accuracy of the appraisal approach can be adversely affected by the subjectivity involved. Also, appraisals can be expensive, can take days or weeks to completed, and may require physical access to the house by the appraiser.

In view of the shortcomings of conventional approaches to valuing houses discussed above, a new approach to valuing houses that was more universally accurate, less expensive, and more convenient would have significant utility.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a block diagram showing some of the components typically incorporated in at least some of the computer systems and other devices on which the facility executes.

FIG. **2** is a flow diagram showing steps typically performed by the facility to automatically determine current values for homes in a geographic area.

FIG. **3** is a table diagram showing sample contents of a recent sales table.

FIG. **4**A is a flow diagram showing steps typically performed by the facility in order to construct a tree.

FIG. **4**B is a flow diagram showing steps typically performed by the facility in order to determine whether and how to split a node of a tree.

FIG. **5** is a table diagram showing sample contents of a basis table containing the basis information selected for the tree.

FIG. **6** is a tree diagram showing a root node corresponding to the basis table **500**.

FIG. **7** is a tree diagram showing a completed version of the sample tree.

FIG. **8** shows steps typically performed by the facility in order to score a tree.

FIG. **9** is a table diagram showing sample results for scoring a tree.

FIG. **10** is a display diagram showing detailed information about an individual home.

FIG. **11** is a display diagram showing a map identifying a number of homes in the same geographic area.

DETAILED DESCRIPTION

A software facility for automatically determining a current value for a home ("the facility") is described. In some embodiments, the facility establishes, for each of a number of geographic regions, a model of housing prices in that region. This model transforms inputs corresponding to home attributes into an output constituting a predicted current value of a home in the corresponding geographic area having those attributes. In order to determine the current value of a particular home, the facility selects the model for a geographic region containing the home, and subjects the home's attributes to the selected model.

In some embodiments, the facility constructs and/or applies housing price models each constituting a forest of classification trees. In some such embodiments, the facility uses a data table that identifies, for each of a number of homes recently sold in the geographic region to which the forest corresponds, attributes of the home and its selling price. For each of the trees comprising the forest, the facility randomly selects a fraction of homes identified in the table, as well as a fraction of the attributes identified in the table. The facility uses the selected attributes of the selected homes, together with the selling prices of the selected homes, to construct a classification tree in which each non-leaf node represents a basis for differentiating selected homes based upon one of the selected attributes. For example, where number of bedrooms is a selected attribute, a non-leaf node may represent the test "number of bedrooms≤4." This node defines **2** subtrees in the tree: one representing the selected homes having 4 or fewer bedrooms, the other representing the selected homes having 5 or more bedrooms. Each leaf node of the tree represents all of the selected homes having attributes matching the ranges of attribute values corresponding to the path from the tree's root node to the leaf node. The facility assigns each leaf node a value corresponding to the mean of the selling prices of the selected homes represented by the leaf node.

In some areas of the country, home selling prices are not public records, and may be difficult or impossible to obtain. Accordingly, in some embodiments, the facility estimates

the selling price of a home in such an area based upon loan values associated with its sale and an estimated loan-to-value ratio.

In order to weight the trees of the forest, the facility further scores the usefulness of each tree by applying the tree to homes in the table other than the homes that were selected to construct the tree, and, for each such home, comparing the value indicated for the home by the classification tree (i.e., the value of the leaf node into which the tree classifies the home) to its selling price. The closer the values indicated by the tree to the selling prices, the higher the score for the tree.

In most cases, it is possible to determine the attributes of a home to be valued. For example, they can often be obtained from existing tax or sales records maintained by local governments. Alternatively, a home's attributes may be inputted by a person familiar with them, such as the owner, a listing agent, or a person that derives the information from the owner or listing agent. In order to determine a value for a home whose attributes are known, the facility applies all of the trees of the forest to the home, so that each tree indicates a value for the home. The facility then calculates an average of these values, each weighted by the score for its tree, to obtain a value for the home. In various embodiments, the facility presents this value to the owner of the home, a prospective buyer of the home, a real estate agent, or another person interested in the value of the home or the value of a group of homes including the home.

In some embodiments, the facility applies its model to the attributes of a large percentage of homes in a geographic area to obtain and convey an average home value for the homes in that area. In some embodiments, the facility periodically determines an average home value for the homes in a geographic area, and uses them as a basis for determining and conveying a home value index for the geographic area.

Because the approach employed by the facility to determine the value of a home does not rely on the home having recently been sold, it can be used to accurately value virtually any home whose attributes are known or can be determined. Further, because this approach does not require the services of a professional appraiser, it can typically determine a home's value quickly and inexpensively, in a manner generally free from subjective bias.

FIG. **1** is a block diagram showing some of the components typically incorporated in at least some of the computer systems and other devices on which the facility executes. These computer systems and devices **100** may include one or more central processing units ("CPUs") **101** for executing computer programs; a computer memory **102** for storing programs and data-including data structures, database tables, other data tables, etc.—while they are being used; a persistent storage device **103**, such as a hard drive, for persistently storing programs and data; a computer-readable media drive **104**, such as a CD-ROM drive, for reading programs and data stored on a computer-readable medium; and a network connection **105** for connecting the computer system to other computer systems, such as via the Internet, to exchange programs and/or data-including data structures. In various embodiments, the facility can be accessed by any suitable user interface including Web services calls to suitable APIs. While computer systems configured as described above are typically used to support the operation of the facility, one of ordinary skill in the art will appreciate that the facility may be implemented using devices of various types and configurations, and having various components.

FIG. **2** is a flow diagram showing steps typically performed by the facility to automatically determine current values for homes in a geographic area. The facility may perform these steps for one or more geographic areas of one or more different granularities, including neighborhood, city, county, state, country, etc. These steps may be performed periodically for each geographic area, such as daily. In step **201**, the facility selects recent sales occurring in the geographic area. The facility may use sales data obtained from a variety of public or private sources.

FIG. **3** is a table diagram showing sample contents of a recent sales table. The recent sales table **300** is made up of rows **301-315**, each representing a home sale that occurred in a recent period of time, such as the preceding 60 days. Each row is divided into the following columns: an identifier column **321** containing an identifier for the sale; an address column **322** containing the address of the sold home; a square foot column **323** containing the floor area of the home; a bedrooms column **324** containing the number of bedrooms in the home; a bathrooms column **325** containing the number of bathrooms in the home; a floors column **326** containing the number of floors in the home; a view column **327** indicating whether the home has a view; a year column **328** showing the year in which the house was constructed; a selling price column **329** containing the selling price at which the home was sold; and a date column **330** showing the date on which the home was sold. For example, row **301** indicates that sale number **1** of the home at 111 Main St., Hendricks, Ill. 62012 having a floor area of 1850 square feet, 4 bedrooms, 2 bathrooms, 2 floors, no view, built in 1953, was for $132,500, and occurred on Jan. 3, 2005. While the contents of recent sales table **300** were included to pose a comprehensible example, those skilled in the art will appreciate that the facility can use a recent sales table having columns corresponding to different and/or a larger number of attributes, as well as a larger number of rows. Attributes that may be used include, for example, construction materials, cooling technology, structure type, fireplace type, parking structure, driveway, heating technology, swimming pool type, roofing material, occupancy type, home design type, view type, view quality, lot size and dimensions, number of rooms, number of stories, school district, longitude and latitude, neighborhood or subdivision, tax assessment, attic and other storage, etc. For a variety of reasons, certain values may be omitted from the recent sales table. In some embodiments, the facility imputes missing values using the median value in the same column for continuous variables, or the mode (i.e., most frequent) value for categorical values.

While FIG. **3** and each of the table diagrams discussed below show a table whose contents and organization are designed to make them more comprehensible by a human reader, those skilled in the art will appreciate that actual data structures used by the facility to store this information may differ from the table shown, in that they, for example, may be organized in a different manner; may contain more or less information than shown; may be compressed and/or encrypted; etc.

Returning to FIG. **2**, in steps **202-205**, the facility constructs and scores a number of trees, such as 100. This number is configurable, with larger numbers typically yielding better results but requiring the application of greater computing resources. In step **203**, the facility constructs a tree. In some embodiments, the facility constructs and applies random forest valuation models using an R mathematical software package available at http://cran.r-project.org/ and described at http://www.maths.lth.se/help/R/.R/library/randomForest/html/randomForest.html. Step **203** is discussed in greater detail below in connection with FIG. **4**.

In step **204**, the facility scores the tree constructed in step **203**. Step **204** is discussed in greater detail below in connection with FIG. **8**.

In steps **206-207**, the facility uses the forest of trees constructed and scored in steps **202-205** to process requests for home valuations. Such requests may be individually issued by users, or issued by a program, such as a program that automatically requests valuations for all homes in the geographic area at a standard frequency, such as daily, or a program that requests valuations for all of the homes occurring on a particular map in response to a request from a user to retrieve the map. In step **206**, the facility receives a request for valuation identifying the home to be valued. In step **207**, the facility applies the trees constructed in step **203**, weighted by the scores generated for them in step **204**, to the attributes in the home identified in the received request in order to obtain a valuation for the home identified in the request. After step **207**, the facility continues in step **206** to receive the next request.

Those skilled in the art will appreciate that the steps shown in FIG. **2** and in each of the flow diagrams discussed below may be altered in a variety of ways. For example, the order of the steps may be rearranged; substeps may be performed in parallel; shown steps may be omitted, or other steps may be included; etc.

FIG. **4**A is a flow diagram showing steps typically performed by the facility in order to construct a tree. In step **401**, the facility randomly selects a fraction of the recent sales in the geographic area to which the tree corresponds, as well as a fraction of the available attributes, as a basis for the tree.

FIG. **5** is a table diagram showing sample contents of a basis table containing the basis information selected for the tree. Basis table **500** contains rows randomly selected from the recent sales table **300**, here rows **302**, **308**, **209**, **311**, **313**, and **315**. The basis table further includes the identifier column **321**, address column **322**, and selling price column **329** from the recent sales table, as well as randomly selected columns for two available attributes: a bedrooms column **324** and a view column **327**. In various embodiments, the facility selects various fractions of the rows and attribute columns of the recent sales table for inclusion in the basis table; here, the fraction one third is used for both.

In some embodiments, the facility filters rows from the basis table having selling prices that reflect particularly rapid appreciation or depreciation of the home relative to its immediately-preceding selling price. For example, in some embodiments, the facility filters from the basis table recent sales whose selling prices represent more than 50% annual appreciation or more than 50% annual depreciation. In other embodiments, however, the facility initially performs the filtering described above, then uses the filtered basis table to construct a preliminary model, applies the preliminary model to the unfiltered basis table, and excludes from the basis table used to construct the primary model those sales where the valuation produced by the preliminary model is either more than 2 times the actual selling price or less than one-half of the actual selling price.

Returning to FIG. **4**A, in step **402**, the facility creates a root node for the tree that represents all of the basis sales contained in the basis table and the full range of each of the basis attributes.

FIG. **6** is a tree diagram showing a root node corresponding to the basis table **500**. The root node **601** represents the sales having identifiers **2**, **8**, **9**, **11**, **13**, and **15**; values of the bedrooms attribute between 1–∞; and values of the view attribute of yes and no.

Returning to FIG. **4**A, in steps **403-407**, the facility loops through each node of the tree, including both the root node created in step **402** and any additional nodes added to the tree in step **405**. In step **404**, if it is possible to "split" the node, i.e., create two children of the node each representing a different subrange of an attribute value range represented by the node, then the facility continues in step **405**, else the facility continues in step **406**. FIG. **4**B is a flow diagram showing steps typically performed by the facility in order to determine whether and how to split a node of a tree. These steps generally identify a potential split opportunity having the highest information gain, and determine whether the information gain of that potential split opportunity exceeds the information gain of the current node. In step **451**, the facility determines whether the node's population—that is, the number of basis sales represented by the node-satisfies a split threshold, such as a split threshold that requires more than three basis sales. If the threshold is not satisfied, then the facility returns to step **404** in step **452** without identifying any split opportunity, such that the facility will not split the node; otherwise, the facility continues in step **453**. Though not shown, the facility may apply a variety of other tests to determine whether the node should be split, including whether any of the selected attribute ranges represented by the node is divisible. For example, where the selected attributes are bedrooms and view, and a node represents the ranges bedrooms=5 and view=no, none of the node's selected attribute ranges can be split.

In steps **453-455**, the facility analyzes the characteristics of the node in order to be able to compare them to characteristics of pairs of possible child nodes that would result from different opportunities for splitting the node. In step **453**, the facility determines the mean selling price among the sales represented by the node to obtain a node mean selling price for the node. Applying step **453** to root node **600** shown in FIG. **6**, the facility determines a mean selling price for the node as shown below in Table 1 by determining the mean of all the selling prices shown in basis table **500**.

TABLE 1

1	Node mean selling price =	$201,400

In step **454**, the facility sums the squares of the differences between the node mean selling price determined in step **454** and the selling price of each sale represented by the node to obtain a node overall squared error. This calculation is shown below in table 2 for root node **601**.

TABLE 2

2	Sale 2 overall squared error = ($201,000-line 1)^2 =	160000
3	Sale 8 overall squared error = ($74,900-line 1)^2 =	16002250000
4	Sale 9 overall squared error = ($253,500-line 1)^2 =	2714410000
5	Sale 11 overall squared error = ($230,000-line 1)^2 =	817960000
6	Sale 13 overall squared error = ($211,000-line 1)^2 =	92160000
7	Sale 15 overall squared error = ($238,000-line 1)^2 =	1339560000
8	Node overall squared error =	20966500000

In step **455**, the facility divides the overall squared error by one fewer than the number of sales represented by the node in order to obtain a node variance. The calculation of step **455** for root node **600** is shown below in table 3.

TABLE 3

9	Node variance = line 8/5 =	4193300000

In steps **456-460**, the facility analyzes the characteristics of each possible split opportunity that exists in the node; that is, for each attribute range represented by the node, any point at which that range could be divided. For root node **600**, three such split opportunities exist: (1) view=no/view=yes; (2) bedrooms≤4/bedroomsz>4; and (3) bedrooms≤5/bedrooms>5. In step **457**, for each side of the possible split opportunity, the facility determines the mean selling price among sales on that side to obtain a split side mean selling price. Table 4 below shows the performance of this calculation for both sides of each of the three possible split opportunities of root node **600**.

TABLE 4

10	Split side mean selling price of view = no side of possible split opportunity 1 = mean of selling prices for sales 2, 8, 11, and 13 =	$179,225
11	Split side mean selling price of view = yes side of possible split opportunity 1 = mean of selling prices for sales 9 and 15 =	$245,750
12	Split side mean selling price for bedrooms≤4 side of possible split opportunity 2 = mean of selling prices of sales 8 and 11 =	$152,450
13	Split side mean selling price for bedrooms>4 side of possible split opportunity 2 = mean of selling prices of sales 2, 9, 13, and 15 =	$225,875
14	Split side mean selling price for bedrooms≤5 side of possible split opportunity 3 = mean of selling prices of sales 8, 11, 13, and 15 =	$188,475
15	Split side mean selling price for bedrooms>5 side of possible split opportunity 3 = mean of selling prices of sales 2 and 9 =	$227,250

In step **458**, the facility sums the squares of the differences between the selling price of each sale represented by the node and the split side mean selling price on the same side of the possible split opportunity to obtain a possible split opportunity squared error. The result of the calculation of step **458** for root node **600** is shown below in table 5.

TABLE 5

16	Possible split opportunity 1 squared error for sale 2 = ($201,000-line 10)^2 =	474150625
17	Possible split opportunity 1 squared error for sale 8 = ($74,900-line 10)^2 =	10883705625
18	Possible split opportunity 1 squared error for sale 9 = ($253,500-line 11)^2 =	60062500
19	Possible split opportunity 1 squared error for sale 11 = ($230,000-line 10)^2 =	2578100625
20	Possible split opportunity 1 squared error for sale 13 = ($211,000-line 10)^2 =	1009650625
21	Possible split opportunity 1 squared error for sale 15 = ($238,000-line 11)^2 =	60062500
22	Possible split opportunity 1 squared error = sum of lines 16-21 =	15065732500
23	Possible split opportunity 2 squared error for sale 2 = ($201,000-line 13)^2 =	618765625
24	Possible split opportunity 2 squared error for sale 8 = ($74,900-line 12)^2 =	6014002500
25	Possible split opportunity 2 squared error for sale 9 = ($253,500-line 13)^2 =	763140625
26	Possible split opportunity 2 squared error for sale 11 = ($230,000-line 12)^2 =	6014002500
27	Possible split opportunity 2 squared error for sale 13 = ($211,000-line 13)^2 =	221265625
28	Possible split opportunity 2 squared error for sale 15 = ($238,000-line 13)^2 =	147015625
29	Possible split opportunity 2 squared error = sum of lines 23-28 =	13778192500
30	Possible split opportunity 3 squared error for sale 2 = ($201,000-line 15)^2 =	689062500
31	Possible split opportunity 3 squared error for sale 8 = ($74,900-line 14)^2 =	12899280625
32	Possible split opportunity 3 squared error for sale 9 = ($253,500-line 15)^2 =	689062500
33	Possible split opportunity 3 squared error for sale 11 = ($230,000-line 14)^2 =	1724325625
34	Possible split opportunity 3 squared error for sale 13 = ($211,000-line 14)^2 =	507375625
35	Possible split opportunity 3 squared error for sale 15 = ($238,000-line 14)^2 =	2452725625
36	Possible split opportunity 3 squared error = sum of lines 30-35 =	18961832500

In line **459**, the facility divides the possible split opportunity squared error by two less than the number of sales represented by the node to obtain a variance for the possible split opportunity. The calculation of step **459** is shown below for the three possible split opportunities of root node **600**.

TABLE 6

37	Variance for possible split opportunity 1 = line 22/4 =	3766433125
38	Variance for possible split opportunity 2 = line 29/4 =	3444548125
39	Variance for possible split opportunity 3 = line 36/4 =	4740458125

In step **460**, if another possible split opportunity remains to be processed, then the facility continues in step **456** to process the next possible split opportunity, else the facility continues in step **461**.

In step **461**, the facility selects the possible split opportunity having the lowest variance. In the example, the facility compares lines **37**, **38** and **39** to identify the possible split opportunity **2** as having the lowest variance. In step **462**, if the selected possible split opportunity variance determined in step **461** is less than the node variance determined in step **455**, then the facility continues in step **464** to return, identifying the split opportunity selected in step **461**, else the facility continues in step **463** to return without identifying a split opportunity. In the example, the facility compares line **38** to line **9**, and accordingly determines to split the root node in accordance with split opportunity **2**.

Returning to FIG. **4**A, in step **405**, where the steps shown in FIG. **4**B determine that the node should be split, the facility creates a pair of children for the node. Each child represents one of the subranges of the split opportunity identified in step **404** and the node's full range of unselected attributes. Each child represents all basis sales whose attributes satisfy the attribute ranges represented by the child. Step **405** is discussed in greater detail below in connection with FIG. **7**.

In step **406**, because the node will be a leaf node, the facility determines the mean selling price of basis sales represented by the node.

In step **407**, the facility processes the next node of the tree. After step **407**, these steps conclude.

FIG. **7** is a tree diagram showing a completed version of the sample tree. It can be seen that the facility added child nodes **702** and **703** to root node **601**, corresponding to the subranges defined by the split opportunity selected in step **461**. Node **702** represents sales whose bedrooms attribute is less than or equal to 4, that is, between 1 and 4, as well as the full range of view attribute values represented by node **601**. Accordingly, node **702** represents sales **8** and **11**. Because this number of sales is below the threshold of 4, node **702** qualifies as a leaf node, and its valuation of $152,450 is calculated by determining the mean selling price of sales **8** and **11**.

Node **703** represents sales with bedrooms attribute values greater than 4, that is, **5**–∞. Node **703** further represents the full range of view attributes values for node **601**. Accordingly, node **703** represents sales **2**, **9**, **13**, and **15**. Because this number of sales is not smaller than the threshold number and the node's ranges are not indivisible, the facility proceeded to consider possible split opportunities. In order to do so, the facility performs the calculation shown below in Table 7. For the following two possible split opportunities: (4) view=no/view=yes; and (5) bedrooms=5/bedrooms>5.

TABLE 7

40	node mean selling price = mean of selling prices for sales 2, 9, 13, and 15 =	$225,875
41	sale 2 overall squared error = ($201,000-line 40)^2 =	618765625
42	sale 9 overall squared error = ($253,500-line 40)^2 =	76314625
43	sale 13 overall squared error = ($211,000-line 40)^2 =	221265625
44	sale 15 overall squared error = ($238,000-line 40)^2 =	147015625
45	node overall squared error =	1750187500
46	node variance = line 45/3 =	583395833
47	split side mean selling price of view = no side of possible split opportunity 4 = mean selling prices of sales 2 and 13 =	$206,000
48	split side mean selling price of view = yes side of possible split opportunity 4 = mean selling prices of sales 9 and 15 =	$245,750
49	split side mean selling price for bedrooms≤5 side of possible split opportunity 5 = mean selling prices of sales 13 and 15 =	$224,500
50	split side mean selling price of bedrooms>5 side of possible split opportunity 5 = mean selling prices of sales 2 and 9 =	$227,250
51	possible split opportunity 4 squared error for sale 2 = ($201,000-line 47)^2 =	25000000
52	possible split opportunity 4 squared error for sale 9 = ($253,500-line 48)^2 =	60062500
53	possible split opportunity 4 squared error for sale 13 = ($211,000-line 47)^2 =	25000000
54	possible split opportunity 4 squared error for sale 15 = ($238,000-line 48)^2 =	60062500
55	possible split opportunity 4 squared error = sum of lines 51-54 =	17012500
56	possible split opportunity 5 squared error for sale 2 = ($201,000-line 50)^2 =	689062500
57	possible split opportunity 5 squared error for sale 9 = ($253,500-line 50)^2 =	689062500
58	possible split opportunity 5 squared error for sale 13 = ($211,000-line 49)^2 =	182250000
59	possible split opportunity 5 squared error for sale 15 = ($238,000-line 49)^2 =	182250000
60	possible split opportunity 5 squared error = sum of lines 56-59 =	1742625000
61	variance for possible split opportunity 4 = line 55/2 =	85062500
62	variance for possible split opportunity 5 = line 60/2 =	871312500

From Table 7, it can be seen that, between split opportunities **4** and **5**, split opportunity **4** has the smaller variance, shown on line **61**. It can further be seen that the variance of possible split opportunity **4** shown on line **61** is smaller than the node variance shown on line **46**. Accordingly, the facility uses possible split opportunity **4** to split node **703**, creating child nodes **704** and **705**. Child node **704** represents basis sales **2** and **13**, and that attribute ranges bedrooms=5-4 and view=no. Node **704** has a valuation of $206,000, obtained by averaging the selling prices of the base of sales **2** and **13**. Node **705** represents base of sales **9** and **15**, and attribute value ranges bedrooms=5-40 and view=yes. Node **705** has valuation $245,750, obtained by averaging the selling price of sales **9** and **15**.

In order to apply the completed tree **700** shown in FIG. **7** to obtain its valuation for a particular home, the facility retrieves that home's attributes. As an example, consider a home having attribute values bedrooms=5 and view=yes. The facility begins at root node **601**, and among edges **711** and **712**, traverses the one whose condition is satisfied by the attributes of the home. In the example, because the value of the bedroom's attribute for the home is 5, the facility traverses edge **712** to node **703**. In order to proceed from node **703**, the facility determines, among edges **713** and **714**, which edge's condition is satisfied. Because the home's value of the view attribute is yes, the facility traverses edge **714** to leaf node **705**, and obtains a valuation for the sample home of $245,750.

Those skilled in the art will appreciate that the tree shown in FIG. **7** may not be representative in all respects of trees constructed by the facility. For example, such trees may have a larger number of nodes, and/or a larger depth. Also, though not shown in this tree, a single attribute may be split multiple times, i.e., in multiple levels of the tree.

FIG. **8** shows steps typically performed by the facility in order to score a tree. In step **801**, the facility identifies recent sales in the geographic area that were not used as a basis for constructing the tree in order to score the tree. In steps **802**-**805**, the facility loops through each sale identified in step **801**. In step **803**, the facility applies the tree to the attributes of the sale to obtain a value. In step **804**, the facility compares the value obtained in step **803** to the selling price for the sale to determine an error magnitude, dividing the difference between valuation and selling price by selling price. In step **806**, the facility calculates a score that is inversely related to the median error magnitude determined in step **804**. After step **806**, these steps conclude.

FIG. **9** is a table diagram showing sample results for scoring a tree. Scoring table **900** scores tree **700** based upon the contents of recent sales table **300**. The scoring table is made up of the rows of recent sales table **300** other than those used as basis sales for constructing the tree, i.e., rows **301**, **303**, **304**, **305**, **306**, **307**, **310**, **312**, and **314**. It further contains the following columns from recent sales table **300**: identifier column **321**, address column **322**, bedroom column **324**, view column **327**, and selling price column **329**. The scoring table further contains a valuation column **911** containing the valuation of each home determined in step **803**. For example, row **307** shows that the facility determines the valuation of $245,750 for sale **7** using tree **700**. In particular, the facility begins at root node **601**; traverses to node **703** because the number of bedrooms **5** is greater than 4; traverses to node **705** because view=yes; and adopts the valuation of node **705**, $245,750. Scoring table **900** further contains an error column **912** indicating the difference between each home's valuation and selling price. For example, row **307** contains an error of 0.0685, the difference between valuation $245,750 and selling price $230,000, divided by selling price $230,000. Associated with the table is a median error field **951** containing the median of error values in the scoring table, or 0.3734. Each tree's median error value is used to determine weightings for the trees that are inversely related to their median error values. In some embodiments, the facility determines the particular tree's weighting by generating an accuracy metric for each tree by subtracting its median error value from 1, and dividing the tree's accuracy measure by the sum of all of the trees' accuracy measures. Also, a variety of different approaches to determine a score that is negatively correlated with the average error may be used by the facility.

When a home is valued using the forest, the sample tree will be applied to the attributes of the home in the same way it was applied to homes in the scoring process described above. (If any attributes of the home are missing, the facility typically imputes a value for the missing attribute based upon the median or mode for that attribute in the recent sales table.) The valuation produced will be averaged with the valuations produced by the other trees of the forest. In the average, each valuation will be weighted by the score attributed by the facility to the tree. This resultant average is presented as the valuation for the home.

FIGS. **10-11** show ways in which valuations generated by the facility may be presented. FIG. **10** is a display diagram showing detailed information about an individual home. The display **1000** includes detailed information **1001** about the home. Despite the fact that the home has not been sold recently, the facility also displays a valuation **1002** for the home, enabling prospective buyers and listing agents to gauge their interest in the home, or permitting the home's owner to gauge his interest in listing the home for sale.

FIG. **11** is a display diagram showing a map identifying a number of homes in the same geographic area. The display **1100** shows homes **1101-1112**. The facility also displays its valuations **1151-1162** of these homes in connection with their location on the map. Presenting the facility's valuations in this way permits home shoppers to obtain an overview of the geographic area, identify special trends within the geographic area, identify the anomalous values as good values or poor picks, etc.

In some embodiments, the valuations displayed or otherwise reported by the facility are not the "raw" valuations directly produced by the valuation model, but rather "smoothed" valuations that are generated by blending the raw valuation generated by the current iteration of the model with earlier valuations. As one example, in some embodiments, the facility generates a current smoothed valuation for a home by calculating a weighted average of a current raw valuation and a smoothed valuation of the same home from the immediately-preceding time period, where the prior smooth valuation is weighted more heavily than the current raw valuation. In some embodiments, where new iterations of the model are constructed and applied daily, the prior smoothed valuation is weighted 49 times as heavily as the current raw valuation; where a new iteration of the model is constructed and applied weekly, the prior smoothed valuation is weighted 9 times as heavily as the current raw valuation; where new iterations of the model are constructed and applied monthly, the previous smoothed valuation is weighted twice as heavily as the current raw valuation. Those skilled in the art will appreciate that a variety of other smoothing techniques may be used in order to dampen erratic movement in a particular home's reported valuation over time.

In some embodiments, the facility constructs and applies compound valuation models to one or more geographic areas. A compound valuation model includes two or more separate classification tree forests, some or all of which may be applied to the attributes of a particular home in order to value it. As one example, in some embodiments, the facility constructs a compound model including both a forest constructed as described above (referred to as a "core forest"), as well as a separate, "high-end" forest constructed from basis sales having a selling price above the 97.5 percentile selling price in the geographic area. In these embodiments, the compound model is applied as follows. First, the core forest is applied to the attributes of a home. If the valuation produced by the core forest is no larger than the 97.5 percentile selling price in the geographic area, then this valuation is used directly as the model's valuation. Otherwise, the facility also applies the high-end forest to the attributes of the home. If the valuation produced by the core forest is above the 99 percentile selling price, then the valuation produced by the high-end forest is used directly as the model's valuation. Otherwise, a weighted average of the valuations produced by the core forest and the high-end forest is used, where the weight of the core forest valuation is based upon nearness of the core model valuation to the 97.5 percentile selling price, while the weight of the high-end forest valuation is based on the nearness of the core forest valuation to the 99 percentile selling price.

In some embodiments, the facility uses valuations produced by the facility over time to calculate a price index for homes in particular geographic areas, which may be larger than, smaller than, or the same as the geographic areas that are the basis for individual valuation models. In order to calculate the index, the facility averages the valuations produced by the facility for houses in a geographic area at each a first and a second date, and generates an indication of the extent and direction of change. For example, the extent may be expressed in terms of dollars or some multiple of a particular number of dollars—such as $1,000—or as a percentage based upon either the first average valuation or the second valuation. The direction may be indicated by a plus or minus sign, an up or down arrow, etc. In some embodiments, the facility displays a visual indication of this price index as part of a visual representation of the corresponding geographic area, such as a map or an aerial photograph. Any visual representation that covers more than one geographic area may contain a price index indication for each such geographic area. In some embodiments, the facility provides these price indices in a variety of other ways, including a table, a chart, a data feed, etc.

It will be appreciated by those skilled in the art that the above-described facility may be straightforwardly adapted or extended in various ways. For example, the facility may use a wide variety of modeling techniques, house attributes, and/or data sources. The facility may display or otherwise present its valuations in a variety of ways. While the foregoing description makes reference to particular embodiments, the scope of the invention is defined solely by the claims that follow and the elements recited therein.

We claim:

1. A computing system for establishing a valuation model for homes in a distinguished geographic area, comprising:

a processor and memory, together comprising:

an identifying unit configured to identify sales information for homes in the distinguished geographic area, the sales information including home attributes and a selling price for each home;

an initializing unit configured to initialize a valuation model, comprising multiple portions, capable of producing a valuation of a home when trained using the sales information; and

a training unit configured to train the initialized valuation model with the identified sales information for at least a portion of the homes in the distinguished geographic area, such that the trained valuation model values each home of the portion of the homes at or near its selling price,

wherein the training includes:

for each of a plurality of sold homes,

first comparing a value indicated for the sold home by a first portion of the portions of the valuation

model to a selling price for the sold home to determine an error magnitude, and

second comparing a value indicated for the sold home by a second portion of the portions of the valuation model to a selling price for the sold home to determine an error magnitude,

determining a first error magnitude for the first portion of the portions of the valuation model based at least in part on the first comparing,

determining a first score for the first portion of the portions of the valuation model based at least in part on the determined first error magnitude for the first portion of the portions of the valuation model,

determining a second error magnitude for the second portion of the portions of the valuation model based on the second comparing, and

determining a second score for the second portion of the portions of the valuation model based at least in part on the determined second error magnitude for the second portion of the portions of the valuation model;

a component configured to generate a first raw valuation for a first home based at least in part on the first portion of the portions of the model the second portion of the portions of the model the first score, and the second score;

a component configured to construct a first new iteration of the valuation model;

a component configured to generate, using the first new iteration of the valuation model, a second raw valuation of the first home; and

a component configured to generate a second smoothed valuation for the first home b calculating a weighted average of the second raw valuation of the first home and a first smoothed valuation of the first home, wherein the second smoothed valuation is based at least in part on how often iterations of the valuation model are constructed.

2. The computing system of claim **1** wherein the training unit:

trains the valuation model using the identified sales information for a first subset of the homes in the distinguished geographic area;

selects a second subset of the homes in the distinguished geographic area that are not in the first subset; and

uses identified sales information for the second subset of homes to validate the trained valuation model by determining the extent to which valuations, by the trained valuation model for the homes in the second subset, diverge from the selling prices of the homes of the second subset.

3. The computing system of claim **1**, wherein the identifying unit identifies sales information for homes in the distinguished geographic area in part by:

identifying homes in the distinguished geographic area that have undergone unusually rapid appreciation or depreciation; and

excluding the identified homes from the identified sales information.

4. The computing system of claim **1**, wherein the valuation model is configured to be automatically applied, at a standard frequency, to a set of homes in the distinguished geographic area.

5. The computing system of claim **1**, wherein the identifying unit is further configured to:

determine that a selling price for a distinguished home is unavailable; and

in response to the determination, impute the selling price for the distinguished home.

6. The computing system of claim **5**, wherein the imputed selling price for the distinguished home is determined by multiplying a loan amount and an estimated regional home-to-value ratio.

7. The computing system of claim **1**, wherein the computing system is configured to obtain a home valuation using the valuation model by:

applying the valuation model to attributes of a distinguished home to determine an incremental valuation; and

blending the incremental valuation with one or more earlier determined valuations for the distinguished home, wherein the blending comprises generating a weighted average of the incremental valuation and the one or more earlier determined valuations in which the one or more earlier determined valuations are more heavily weighted than the incremental valuation.

8. The computing system of claim **1**, wherein where iterations of the valuation model are constructed daily, the first smoothed valuation of the first home is weighted at least forty-nine times as heavily as the second raw valuation of the first home, wherein where iterations of the valuation model are constructed weekly, the first smoothed valuation of the first home is weighted at least nine times as heavily as the second raw valuation of the first home, and wherein where iterations of the valuation model are constructed monthly, the first smoothed valuation of the first home is weighted at least twice as heavily as the second raw valuation of the first home.

9. The computing system of claim **1**, wherein where iterations of the valuation model are constructed daily, the first smoothed valuation of the first home is weighted more heavily relative to the second raw valuation of the first home than where iterations of the valuation model are constructed weekly.

10. A method for establishing a valuation model for homes in a distinguished geographic area, the method comprising:

identifying sales information for homes in the distinguished geographic area, the sales information including home attributes and a selling price for each home;

initializing a valuation model, comprising multiple portions, capable of producing a valuation of a home when trained using the sales information;

training the initialized valuation model with the identified sales information for at least a portion of the homes in the distinguished geographic area, such that the trained valuation model values each home of the portion of the homes at or near its selling price,

wherein the training includes:

for each of a plurality of sold homes,

first comparing a value indicated for the sold home by a first portion of the portions of the valuation model to a selling price for the sold home to determine an error magnitude, and

second comparing a value indicated for the sold home by a second portion of the portions of the valuation model to a selling price for the sold home to determine an error magnitude,

determining a first error magnitude for the first portion of the portions of the valuation model based at least in part on the first comparing,

determining a first score for the first portion of the portions of the valuation model based at least in part

on the determined first error magnitude for the first portion of the portions of the valuation model,

determining a second error magnitude for the second portion of the portions of the valuation model, and

determining a second score for the second portion of the portions of the valuation model based at least in part on the determined second error magnitude for the second portion of the portions of the valuation model;

generating a first raw valuation for a first home using the first portion of the portions of the valuation model;

generating a second raw valuation for the first home using the second portion of the portions of the valuation model; and

generating a third valuation for the first home using the first raw valuation, the second raw valuation, the first score, and the second score.

11. The method of claim **10**, wherein the training further includes:

training the valuation model using the identified sales information for a first subset of the homes in the distinguished geographic area;

selecting a second subset of the homes in the distinguished geographic area that are not in the first subset; and

using identified sales information for the second subset of homes to validate the trained valuation model by determining the extent to which valuations, by the trained valuation model for the homes in the second subset, diverge from the selling prices of the homes of the second subset.

12. The method of claim **10**, wherein the sales information is identified for homes in the distinguished geographic area in part by:

identifying homes in the distinguished geographic area that have undergone unusually rapid appreciation or depreciation; and

excluding the identified homes from the identified sales information.

13. The method of claim **10**, further comprising:

iteratively applying, at a standard iteration frequency, the valuation model to a set of homes in the distinguished geographic area; and

storing the valuation for each home in the set of homes for including in a map depiction of the distinguished geographic area.

14. The method of claim **10**, wherein the identifying further comprises:

determine that a selling price for a distinguished home is unavailable; and

in response to the determination, imputing the selling price for the distinguished home.

15. The method of claim **14**, wherein the imputed selling price for the distinguished home is determined by multiplying a loan amount and an estimated regional home-to-value ratio.

16. The method of claim **10**, further comprising:

applying the valuation model to attributes of a distinguished home to determine an incremental valuation; and

blending the incremental valuation with one or more earlier determined valuations for the distinguished home, wherein the blending comprises generating a weighted average of the incremental valuation and the one or more earlier determined valuations in which the one or more earlier determined valuations are more heavily weighted than the incremental valuation.

17. The method of claim **10** further comprising:

using the valuation model to produce first valuations for a group of homes in a portion of the distinguished geographic area at a first time index;

determining a first average of the first valuations;

using the valuation model to produce second valuations for the group of homes in the portion of the distinguished geographic area at a second later time index;

determining a second average of the second valuations; and

generating an extent and direction of change between the first average and the second average.

18. The method of claim **17**, wherein indications of the extent and direction of change are provided, in a graphical topological representation, in association with a portion of the graphical topological representation that is for the portion of the distinguished geographic area.

19. The method of claim **10** further comprising:

using the valuation model to produce valuations for a group of homes in a portion of the distinguished geographic area; and

generating a map with indications of the produced valuations, each valuation indication provided in association with graphical representations, on the map, of a location of the home for which that valuation was produced.

20. The method of claim **10**, wherein the valuation model comprises:

a first classification tree forest trained on sales information for a first group of homes in the distinguished geographic area; and

a second classification tree forest trained on sales information for a second group of homes in the distinguished geographic area that is a proper subset of the first group of homes;

wherein the second group of homes is selected based on the selling price for each home in the second group of homes being above a threshold for the distinguished geographic area.

21. The method of claim **10**, further comprising:

generating an accuracy metric for the second portion of the portions of the valuation model based upon the determined second error magnitude for the second portion of the portions of the valuation model and the determined first error magnitude for the first portion of the portions of the valuation model.

22. A computing system for applying a valuation model for homes, comprising:

a processor and memory, together comprising:

the valuation model, comprising multiple portions, that was trained by:

applying sales information for homes including home attributes and a selling price for each home, such that the valuation model values each home of the portion of the homes at or near its selling price, wherein the training of the valuation model includes:

for each of a plurality of sold homes,

comparing a value indicated for the sold home by a first portion of the portions of the valuation model to a selling price for the sold home to determine an error magnitude,

determining a first error magnitude for the first portion of the portions of the valuation model based at least in part on the comparing, and

determining a first score for the first portion of the portions of the valuation model based at least in

part on the determined first error magnitude for the first portion of the portions of the valuation model;

an application component configured to receive an identification of one or more homes and, in response, use the valuation model to generate a valuation for each of the one or more homes; and

an output module configured to generate a graphical interface including indications based at least in part on the valuations generated for the one or more homes.

23. The computing system of claim **22**, wherein the sales information is identified for homes in a distinguished geographic area in part by:

identifying homes in the distinguished geographic area that have undergone unusually rapid appreciation or depreciation; and

excluding the identified homes from the identified sales information.

24. The computing system of claim **22**, wherein the application component generates the valuation for each of the one or more homes by:

applying the valuation model to attributes of a distinguished home to determine an incremental valuation; and

blending the incremental valuation with one or more earlier determined valuations for the distinguished home, wherein the blending comprises generating a weighted average of the incremental valuation and the one or more earlier determined valuations in which the one or more earlier determined valuations are more heavily weighted than the incremental valuation.

25. The computing system of claim **22**,

wherein the application component generates the valuation for each of the one or more homes by:

using the valuation model to produce first valuations for the one or more homes at a first time index;

determining a first average of the first valuations;

using the valuation model to produce second valuations for the one or more homes at a second later time index; and

determining a second average of the second valuations; and

wherein the output module configured to generate the indications based on the valuations as indications of an extent and direction of change between the first average and the second average.

26. The computing system of claim **25**, wherein indications of the extent and direction of change are provided in association with a portion of a map representation of a distinguished geographic area in which the one or more homes are located.

27. The computing system of claim **22**, wherein the graphical interface is a map with indications of the generated valuations, each valuation indication provided in association with graphical representations, on the map, of a location of the home for which that valuation was produced.

28. The computing system of claim **22**, wherein the valuation model comprises:

a first classification tree forest trained on sales information for a first group of homes in a distinguished geographic area; and

a second classification tree forest trained on sales information for a second group of homes in the distinguished geographic area.

29. The computing system of claim **28**,

wherein the second group of homes is a proper subset of the first group of homes; and

wherein the second group of homes is selected based on the selling price for each home in the second group of homes being above a threshold for the distinguished geographic area.

30. The computing system of claim **22**, further comprising:

a component configured to generate a first raw valuation for a first home based at least in part on the first portion of the portions of the model and the first score;

a component configured to construct a first new iteration of the valuation model;

a component configured to generate, using the first new iteration of the valuation model, a second raw valuation of the first home; and

a component configured to generate a second smoothed valuation for the first home by calculating a weighted average of the second raw valuation of the first home and a first smoothed valuation of the first home, wherein the second smoothed valuation is based at least in part on how often iterations of the valuation model are constructed.

31. A computing system for establishing a valuation model for homes in a distinguished geographic area, comprising:

a processor and memory, together comprising:

an identifying unit configured to identify sales information for homes in the distinguished geographic area, the sales information including home attributes and a selling price for each home, wherein the identifying unit identifies sales information for homes in the distinguished geographic area in part by:

identifying homes in the distinguished geographic area that have undergone unusually rapid appreciation or depreciation,

excluding the identified homes from the identified sales information,

determining that a selling price for a distinguished home is unavailable, and

in response to the determination, imputing the selling price for the distinguished home;

an initializing unit configured to initialize a valuation model, comprising multiple portions, capable of producing a valuation of a home when trained using the sales information; and

a training unit configured to train the initialized valuation model with the identified sales information for at least a portion of the homes in the distinguished geographic area, wherein the training includes:

for each of a plurality of sole homes,

comparing a value indicated for the sold home by a first portion of the portions of the valuation model to a selling price for the sold home to determine an error magnitude,

determining a first error magnitude for the first portion of the portions of the valuation model based at least in part on the comparing, and

determining a first score for the first portion of the portions of the valuation model based at least in part on the determined first error magnitude for the first portion of the portions of the valuation model;

a component configured to generate a first raw valuation for a first home based at least in art on the first portion of the portions of the model and the first score;

a component configured to construct a first new iteration of the valuation model;

a component configured to generate, using the first new iteration of the valuation model, a second raw valuation of the first home; and

a component configured to generate a second smoothed valuation for the first home by calculating a weighted average of a second raw valuation of the first home and a first smoothed valuation of the first home, wherein the second smoothed valuation is based at least in part on often iterations of the valuation model are constructed,

wherein the valuation model is configured to be automatically applied, at a standard frequency, to a set of homes in the distinguished geographic area.

32. The computing system of claim **31**, wherein the imputed selling price for the distinguished home is determined by multiplying a loan amount and an estimated regional home-to-value ratio.

33. The computing system of claim **31**, wherein the computing system is configured to obtain a home valuation using the valuation model by:

applying the valuation model to attributes of the distinguished home to determine an incremental valuation; and

blending the incremental valuation with one or more earlier determined valuations for the distinguished home, wherein the blending comprises generating a weighted average of the incremental valuation and the one or more earlier determined valuations in which the one or more earlier determined valuations are more heavily weighted than the incremental valuation.

34. The computing system of claim **31** such that the trained valuation model values each home of the portion of the homes at or near its selling price, wherein the training unit:

trains the valuation model using the identified sales information for a first subset of the homes in the distinguished geographic area;

selects a second subset of the homes in the distinguished geographic area that are not in the first subset; and

uses identified sales information for the second subset of homes to validate the trained valuation model by determining the extent to which valuations, by the trained valuation model for the homes in the second subset, diverge from the selling prices of the homes of the second subset.

35. A method for establishing a valuation model for homes in a distinguished geographic area, the method comprising:

identifying sales information for homes in the distinguished geographic area, the sales information including home attributes and a selling price for each home, wherein the sales information is identified for homes in the distinguished geographic area in part by:

identifying homes in the distinguished geographic area that have undergone unusually rapid appreciation or depreciation, and

excluding the identified homes from the identified sales information;

initializing a valuation model, comprising multiple portions, capable of producing a valuation of a home when trained using the sales information; and

training the initialized valuation model with the identified sales information for at least a portion of the homes in the distinguished geographic area, such that the trained valuation model values each home of the portion of the homes at or near its selling price, wherein the training comprises:

for each of a plurality of sold homes,

comparing a value indicated for the sold home b a first portion of the portions of the valuation model to a selling price for the sold home to determine an error magnitude,

determining a first error magnitude for the first portion of the portions of the valuation model based at least in part on the comparing, and

determining a first score for the first portion of the portions of the valuation model based at least in part on the determined first error magnitude for the first portion of the portions of the valuation model;

generating a first raw valuation for a first home based at least in part on the first portion of the portions of the model and the first score;

constructing a first new iteration of the valuation model;

generating using the first new iteration of the valuation model a second raw valuation of the first home; and

generating a second smoothed valuation for the first home by calculating a weighted average of a second raw valuation of the first home and a first smoothed valuation of the first home, wherein the second smoothed valuation is based at least in part on often iterations of the valuation model are constructed.

36. The method of claim **35**, further comprising:

iteratively applying, at a standard iteration frequency, the valuation model to a set of homes in the distinguished geographic area; and

storing the valuation for each home in the set of homes for including in a map depiction of the distinguished geographic area.

37. The method of claim **35**, wherein the identifying further comprises:

determine that a selling price for a distinguished home is unavailable; and

in response to the determination that the selling price for the distinguished home is unavailable, imputing the selling price for the distinguished home.

38. The method of claim **37**, wherein the imputed selling price for the distinguished home is determined by multiplying a loan amount and an estimated regional home-to-value ratio.

39. The method of claim **35**, further comprising:

applying the valuation model to attributes of a distinguished home to determine an incremental valuation; and

blending the incremental valuation with one or more earlier determined valuations for the distinguished home, wherein the blending comprises generating a weighted average of the incremental valuation and the one or more earlier determined valuations in which the one or more earlier determined valuations are more heavily weighted than the incremental valuation.

40. The method of claim **35** further comprising:

using the valuation model to produce first valuations for a group of homes in a portion of the distinguished geographic area at a first time index;

determining a first average of the first valuations;

using the valuation model to produce second valuations for the group of homes in the portion of the distinguished geographic area at a second later time index;

determining a second average of the second valuations; and

generating an extent and direction of change between the first average and the second average.

41. The method of claim **40**, wherein indications of the extent and direction of change are provided, in a graphical topological representation, in association with a portion of the graphical topological representation that is for the portion of the distinguished geographic area.

42. The method of claim **35** further comprising:

using the valuation model to produce valuations for a group of homes in a portion of the distinguished geographic area; and

generating a map with indications of the produced valuations, each valuation indication provided in association with graphical representations, on the map, of a location of the home for which that valuation was produced.

43. The method of claim **35**, wherein the valuation model comprises:

a first classification tree forest trained on sales information for a first group of homes in the distinguished geographic area; and

a second classification tree forest trained on sales information for a second group of homes in the distinguished geographic area that is a proper subset of the first group of homes;

wherein the second group of homes is selected based on the selling price for each home in the second group of homes being above a threshold for the distinguished geographic area.

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